Bridge 60
Delaware, Lackawanna & Western Railroad
Scranton
Lackawanna County
Pennsylvania

HAER No. PA-132A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
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HAER PA 35-SCRAN, 4-A-

HISTORIC AMERICAN ENGINEERING RECORD

Delaware, Lackawanna & Western Railroad: Scranton Yards
Bridge 60

HAER NO. PA-132A

LOCATION: Over Seventh Avenue, Lackawanna River and Bridge Street southwest of Lackawanna Avenue

UTM: 18/44373/458437
QUAD: Scranton

DATE OF CONSTRUCTION: 1907-8

ENGINEER/ ARCHITECT: Lincoln Bush, chief engineer; A.E. Deal, bridge engineer; F.J. Nies, architect of signal tower

CONTRACTOR: McClintic-Marshall Construction Company

PRESENT OWNER: Consolidated Rail Corporation

PRESENT USE: Used for freight and excursion trains.

SIGNIFICANCE: Bridge 60 stands at the west end of the Scranton yards. It controlled traffic between the yards and the D,L & W's mainline and Bloomsburg branch. Its construction is typical of D,L & W plate girder and concrete railroad bridges of the turn of the century.

HISTORIANS: Kathryn Steen and Amy Slaton
Delaware, Lackawanna & Western Railroad: Scranton Yards Recording Project, 1989

INTRODUCTION

The western end of the D,L & W railroad yards in Scranton, Pennsylvania, is marked by a six-span plate girder railroad bridge. The number of yard tracks diminished to six tracks heading west over the bridge. The bridge, built in 1907-1908, crosses, from east to west, Bridge Street, one set of Delaware & Hudson Railroad tracks, the Lackawanna River, and one set of Central Railroad of New Jersey tracks. The last two spans on the western side are approach spans crossing the remainder of the downhill slope of the Lackawanna River's west bank. Since the bridge "guarded" the entrance and exit to the yards, an interlocking tower to control the switches and signals was mounted on the side. It is the third bridge on this site: first to be built was a wooden trestle bridge, replaced by a stone arch structure in about 1860.[1] This was dismantled and blown up as the present steel bridge was being built in 1907-08. The McClintic-Marshall Company of Pittsburgh, famous for constructing the Golden Gate and the George Washington Bridges designed and built Bridge 60.

SUPERSTRUCTURE

Bridge 60 is a deck plate girder bridge. Plate girder bridges came into wide use in the late nineteenth century as steel processes developed. The basic open hearth furnace and improved rolling techniques allowed steel girders to be mass produced economically. Many railroads chose to build plate girder bridges because of their simplicity of the design, manufacture, and maintenance. Plate girders could be used over spans of 20 to 110 feet.[2] To strengthen the bridge, particularly in areas under more strain, the web of the girders was reinforced by vertical "stiffeners" located near the ends of the girders and at intervals along the girders.[3]

The second and third spans over the D & H tracks and the Lackawanna River are made of the deepest girders in the bridge. These twelve continuous girders are braced laterally in pairs; each pair supports a set of tracks and is free to accommodate its individual load.[4] The lateral bracing consisted of a Warren trussing arrangement of horizontal supports at the upper and lower flanges of the girders, periodically supplemented with vertical braces. Lateral bracing is necessary to make the bridge rigid enough to withstand horizontal forces caused by the acceleration and braking of locomotives.[5]

The span on the eastern side nearest the yards is identical

to the main span in the lateral bracing pattern. The girders of this first span, however, are angled slightly more northeasterly than the main span girders. Consequently, an extra, smaller girder was added on the south side to support the southeast corner of the deck not supported by the twelve larger girders.

The three spans on the western side of the bridge spread further apart at an angle to accommodate the diverging tracks of the Bloomsburg line and the mainline to Buffalo. The girder of the fifth span was originally a simple, only smaller, plate girder like the others. Now, however, the steel is encased in concrete.[6]

All the girders rest on concrete piers or abutments. The load of the span is transferred to the concrete supports in a variety of ways. At the eastern abutment, there are twelve expansion shoes between the girders and the abutment. The first pier heading west is equipped with roller nests. The second concrete pier is set much lower than the first because of the slope of the land. Steel beams with concave, steel lattice braces set in fixed shoes rest on top of the second concrete pier and make up the distance between the lower pier and the bottom of the girders. The fourth span was constructed of a deeper plate girder than the fifth, making the fifth pier a two-level pier. The lower level, which held the end of the fourth span, employs movable shoes. The upper level of the fifth pier, as well as the sixth pier and western abutment, has no shoes or roller nests. At these joints, which are expandable, the girder simply rests on horizontal steel plates that are positioned

between the girder and concrete abutments.[7]

The deck of the bridge is reinforced concrete. Solid decks like that of Bridge 60, as opposed to open decks where the ties are laid directly on the supporting girders, prevent debris from dropping below the bridge. More importantly, a solid floor prevents the rails from shifting, provides a smoother ride, and makes maintenance easier.[8]

INTERLOCKING TOWER

Above the deck, the bridge was a busy place. Photographs from 1908 show the bridge equipped with the nearly obsolete banjo, or enclosed disk, signals, as well as a myriad of ground signals to guide trains through the switching mechanism.[9] The interlocking tower was located over the third pier on the south side of the bridge, reaching two stories above the deck level to provide a wide field of vision for the signal and switch operators within. Like the two interlocking towers at the other end of the Scranton yards, it may have been mechanically operated,[10] although the Interstate Commerce Commission inventory of 1918 lists equipment for compressed air, suggesting instead that the interlocking mechanism may have been pneumatic.[11] In any case, the mechanism contained thirty-nine levers for signals, switches and switch locks.[12] The interlocking tower was removed from the bridge in the 1950s.[13]

SUBSTRUCTURE

As it spans roadways, rail tracks and the Lackawanna River, all of which sit on different levels, Bridge 60 rests on several types of abutments and piers. At its far east and west ends, "breast" abutments--perpendicular to the track bed above--hold the span at about 20 and 16 feet above street level, respectively. The three easternmost piers are made of concrete, with the central of these spans comprised of steel piers atop a concrete pier. In both abutments, and in the two western-most piers, masonry from the previous bridge on this site, circa 1860,[14] is retained. Plans for the bridge show worn rails used as horizontal reinforcement only in the far west pier; no other metal reinforcement appears in plans or in currently visible portions of the bridge.[15]

The banks of the Lackawanna River under Bridge 60 were the site of many light industries, warehouses and rail freight facilities in 1908, probably built to utilize tracks of the D & H Railroad on the east bank and the Central Railroad of New Jersey on the west bank. D,L & W tracks did not directly service these buildings. Nonetheless, the construction of Bridge 60 in 1908 included reconstruction of some retaining walls beneath the bridge. Long masonry retaining walls were replaced with concrete along the west bank, which was the outside of the river's curve at this point and subject to stronger water forces than the east bank. Original

masonry was kept intact on the east side of the river, and is still visible. A few industries operate today in this small, steep cut, though it was badly flooded several times in this century, apparently without damage to Bridge 60. For information on the D,L & W's use of concrete during the early twentieth century, see the HAER report on the Cedar Avenue Bridge of the D,L & W's Scranton yards, HAER #PA-132-J.

NOTES

1.Interstate Commerce Commission, Inventory Schedule of Structures, Valuation Section 21, Account No. 6, (December 29, 1919), 74.

2.J.A.L. Waddell, Bridge Engineering, 2 volumes, first edition (New York: John Wiley and Sons, Inc., 1925), 46-47, 408; and Railway Engineering and Maintenance Cyclopedia, third edition (New York: Simmons-Boardman Publishing Company, 1929), 507; and Charles Lee Crandall and Fred Asa Barnes, Railroad Construction (New York: McGraw-Hill Book Company, 1913), 239.

3.F.C. Kunz, Design of Steel Bridges, first edition, (New York: McGraw-Hill Book Co., Inc., 1915), 157.

4.Kunz, 145.

5.William Guy Williams, I-Beam and Girder Plates (Scranton, Pa.: International Textbook Co., 1947), 4.

6.McClintic-Marshall Construction Company, Erection Plan Bridge #60, July 28, 1906, (plans), owned by Delaware, Lackawanna and Western Railroad Company, Steamtown National Historic Site, Scranton, Pennsylvania.

7.McClintic-Marshall, Erection Plan, (plans).

8.Cyclopedia, 532-534; and Williams, 2,5.

9.Delaware, Lackawanna and Western Railroad Company, photograph of Bridge 60, December 10, 1908, George Arents Research Library, Syracuse University.

10."New Delaware, Lackawanna & Western Specifications for Portland Cement," Railway Age Gazette Vol. 54, No. 4, 334.

11.I.C.C., Inventory, 216, 219.

12.Delaware, Lackawanna and Western List of Officers, Agents, Stations, Equipment, Facilities, Etc., 1917, p.48.

13.A. Berle Clemenson, Historic Resource Study: Steamtown National Historic Site (Denver: National Park Service, Denver Service Center, 1988), 134.

14.I.C.C., Inventory, 72.

15.McClintic-Marshall, Erection Plan, (plans).

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